Most water used on base is obtained from local groundwater sources from four Wellfields (South Base, South Track, North Base, and PL). In addition, approximately 7.6 million L (2 million gal) of water per day are obtained from AVEK. The old Main Base Wellfield and most pre-EAFB wells have been abandoned. There are currently six active wells in the South Base and South Track Wellfield. The North Base Wellfield has one active well. PL receives water from five active wells in the Rocket Site Wellfields. DFRC purchases water from the EAFB water system. The distribution system consists of a series of pipes ranging in size from 15 to 36 cm (6 to 14 in) in diameter, booster pump stations, and storage tanks. (EAFB 1992)

Average daily water demand is 15 million L per day (mLd) (4 million gal per day (mgd)), with a projected future demand of 17 mLd (4.5 mgd). Peak daily potable water demand is 39 mLd (10 mgd) with future peak demand predicted to be 44 mLd (12 mgd). Present maximum capacity is 63 mLd (17 mgd). (EAFB 1994-A, DFRC 1996)

Groundwater

The following focuses on the particular hydrological attributes most likely to be affected by the alternative; i.e., groundwater levels. Because groundwater at some sites is potentially contaminated, information is also provided on existing hazardous waste conditions and status of remedial investigation and feasibility studies. The region of influence for hydrology includes the Antelope Valley watershed or the Lancaster and North Muroc Sub-Basins. (EAFB 1992)

The Antelope Valley, one of the largest groundwater basins in southern California, is divided into sub-basins bounded by faults or other relatively impermeable groundwater barriers. The southern part of EAFB, from which most EAFB water is pumped, and AF Plant 42 are in the Lancaster sub-basin. (EAFB 1992)

Groundwater follows the same general patterns as surface water with flow from recharge areas at the basin margins to discharge areas in the valley. Before extensive groundwater pumpage began, springs and seeps were common around the dry lakes, and wells flowed without pumping in an area of more than 600 sq km (250 sq mi) at the turn of the century. Groundwater levels dropped rapidly with extensive agricultural development during the first half of the century, and groundwater depressions, which still exist, formed in areas with high pumpage rates. However, as awareness of the problem increased and cost of pumping water from greater depths made agricultural use less economical, importation of water from northern California began and groundwater levels dropped less rapidly. Although current pumpage still greatly exceeds the safe yield of the basin of 51,000 million L (13,400 million gal) of water per year estimated in 1975, groundwater elevations leveled and in some cases even rose during the 1980's. Groundwater use, which was approximately 159,000 million L (42,000 million gal) in 1983, was projected to increase to approximately 190,000 million L (50,000 million gal) per year in the year 2000. This rate includes industrial, residential, and agricultural water use as well as groundwater pumped at EAFB. (EAFB 1992)

The South Base and South Track Wellfields are in the Lancaster subunit, which also supplies water to agricultural communities south of the base. Limited amounts of water are pumped from the North Base Wellfield in the North Muroc subunit. Remote facilities, such as the golf course, are supplied by wells not connected to the main domestic water supply system. The 1990 rate of pumpage was approximately 7,500 million L (2,000 million gal) through the baseline year 1993. Groundwater levels dropped rapidly during the first half of the century and leveled off in the 1960's and 1970's. However, a depression has formed in the groundwater table around the South Base and South Track Wellfields, which supply most of the water pumped by the base. Water levels remain fairly stable in isolated wells, but drop more rapidly in wells in South Base and South Track Wellfields. (USAF 1992-C)

The 45 mLd (12 mgd) allocation from the AVEK Water Agency will reduce pumping requirements. EAFB's current plan is to use the AVEK allocation instead of the North Base Wellfield. (EAFB 1992)

AF Plant 42

The water table is approximately 75 to 130 m (250 to 400 ft) below ground surface with flow toward the north and northeast. (EAFB 1992)

3.1.1.8 Geology and Soils

Seismicity

EAFB is located in a relatively aseismic or inactive earthquake area relative to the rest of Southern California. Active and potentially active faults located in the region that may have the greatest potential to generate significant strong ground motion (earthquakes) are the San Andreas and Garlock faults. No faults are known to occur beneath the four proposed EAFB sites, and these sites are not located within an Alquist-Priolo Special Studies Zone (Hart 1990). The nearest faults considered to have potential for ground surface rupture are the Mirage Valley fault, located approximately 3 km (2 mi) southeast of the sites; and possibly the North Muroc fault, located approximately 4 km (2.5 mi) north of the sites. Based on the medium to very dense soils, potential for seismic settlements or differential compaction is considered to be low. (EAFB 1992)

Land Subsidence/Fissuring and Liquefaction

Subsidence and liquefaction are two geologic phenomena that can result from seismic activity. Subsidence is any settling or sinking of the ground surface arising from surface or subsurface causes. Its usual form is a dish-shaped or bowl-shaped region of downward surface displacements. Some types of subsidence can be the result of natural processes, including natural compaction of loosely consolidated alluvium, as well as tectonics and earthquakes. Other types are caused by human activities. Subsidence and earth fissures have been documented at numerous locations within the Antelope Valley. Given the relatively shallow depth to bedrock beneath the sites, lack

of groundwater overlying alluvium, and lack of any fissures or fissure-related features at the sites, ground fissures, faults, or subsidence are unlikely to occur. (EAFB 1992)

Liquefaction is a process by which loose, water-saturated granular materials (silt, sand, or gravel) behave for a short time as dense fluid rather than a solid mass, usually as a result of ground shaking of high intensity and long duration. Prerequisite conditions are shallow groundwater (typically less than 15 m (50 ft)) and saturated, loose, cohesionless, granular soils. Occurrence of liquefaction is considered to be minimal or nonexistent due to the thin cover of soil overlying bedrock and lack of groundwater in the alluvium. (EAFB 1992)

Lowering the water table in clay-rich sediments such as playa lakebeds with high shrink/swell potential can cause the clay to contract. Land surface can subside and large desiccation fissures called mudcracks can form. Since 1920, mudcracks have been found on Rogers Dry Lake. By 1968, approximately 20 percent of the playa was covered with polygons. New fissures continue to form and occasionally damage runways on the lakebed. Land subsidence has occurred, resulting in differential vertical ground movement of approximately 1 m (3 ft) on the playa surface. (EAFB 1992)

3.1.1.9 Health and Safety

Both EAFB and DFRC have comprehensive occupational and flight safety programs intended to minimize the risk of injury or property damage. Operations must comply with OSHA requirements (Cal-OSHA where contractor personnel are utilized) as well as applicable Air Force, NASA, and local safety regulations. A project specific Health and Safety Plan approved by appropriate range officers would be required prior to the start of testing. (DFRC 1996, EAFB 1994-C)

The 412 Test Wing Range Safety Office ensures that safety is a priority during all range activities. AFFTC Instruction 11-1, Aircrew Operations, sets policies and defines procedures for aircrews operating aircraft at EAFB. This instruction addresses topics including ground and inflight procedures, traffic patterns, emergency procedures, and flight restrictions.

Fire protection on EAFB and DFRC is provided by the 95th Civil Engineering Group. Five fire stations serve the base. Medical care is provided by the EAFB hospital, which has a 15-bed capacity and provides both medical and dental services. DFRC maintains a medical dispensary for routine evaluations and emergency response operations. There are also three hospitals in Lancaster and one in Palmdale. (EAFB 1994-A)

Specific safety and health requirements for the X-33 Program will be developed by EAFB in conjunction with NASA and the X-33 Phase II Industry Partner. As a minimum, the X-33 Program can expect to submit preliminary and final site plans, safety standard operating procedures, a safety assessment report, and a missile flight safety operational plan. These documents will be prepared in accordance with EAFB, USAF, and DOD regulations.

3.1.1.10 Operational Noise

The major noise sources at EAFB and DFRC are vehicle traffic and aircraft operations, including fixed and rotary wing air traffic, engine testing and sonic booms. Noise level measurements are routinely performed to monitor conditions and provide a basis for corrective actions, if necessary. Noise descriptive information and units of measurement defintions and analogies can be found in Section 4.3.1.

Noise contours for 65 dBA and greater extend as far as 10 km (6.3 mi) from Runway 04/22 and lie completely within the boundary of EAFB. Parts of the on-base recreation areas lie between the 65 and 70 dBA contours. These areas include the EAFB Rod and Gun Club (Combat Arms Range), base golf course, off-highway vehicle area number 1, and some of the picnic areas and athletic fields. The Main Base residential area is outside the 65 dBA contour; however, two smaller residential areas separate from the main community lie between the 65 to 70 dBA and 70 to 75 dBA contours. The Main Base has a range of exposure from 65 to 85 dBA, the South Base 70 to 85 dBA. On-base land under the 80 dBA noise contours is primarily open space and test program support areas. The South Base and a portion of the Main Base are currently within the 80 dBA noise level; therefore, small areas of administrative, commercial, and industrial land are subject to these noise levels. The residential area and hospital are located outside the 80 dBA contours.

Areas off base that are within the 80 dBA noise contours are located to the north, west, and south-west of EAFB. Areas affected by the contour are primarily open space; however, the towns of Boron, Desert Lakes, North Edwards, and Rosamond are close to or within this contour. The Boron prison is approximately 0.8 km (0.5 mi) outside the 80 dBA contour. The area north of EAFB is primarily open space.

The area around PL is subject to very high levels of noise during rocket engine tests. Test firings occur during daytime hours for 1 to 3 minutes on an infrequent basis. Personnel at the test site remain in buildings designed to protect them from high noise levels. Testing of smaller engines is also conducted at this location, and noise levels are less than half those produced by the large Titan engines. Approximately 1,750 people reside within the 80 dBA contour of Titan test firings. Off-base land is primarily open space, with small industrial, residential, commercial, and public/ recreation areas.

EAFB and DFRC have had minimal environmental problems associated with noise as it relates to communities, population concentrations, or the public in general due to: the isolation achieved by their location in a remote and sparsely populated area of the Mojave Desert; the vast airspace available through DOD and Department of Transportation (DOT) to conduct flight research operations; and carefully planned air corridors within the proscribed airspace at altitudes and over geographic areas that successfully avoid populated communities. (EAFB 1992)

3.1.1.11 Transportation

Roadways

Primary off-base roads accessing EAFB are State Route (SR) 58 which crosses the northern edge of the base, SR 14 (Antelope Valley Freeway) and Sierra Highway which skirt the western edge of the base, and U.S. 395 which is on the eastern edge of the base. SR 58 connects the communities of Bakersfield, Tehachapi, Mojave, Boron, Kramer Junction, and Barstow. SR 14 and Sierra Highway connect the communities of Palmdale, Lancaster, Rosamond, and Mojave. U.S. 395 connects Victor Valley and Kramer Junction. A transportation map showing primary road and rail access is shown in Figure 3.1-3. It is projected that the portions of these highways near EAFB will continue to operate below capacity. (EAFB 1992)

Access onto public roads at the North Gate connects SR 58 with Rosamond Boulevard on the base. Rosamond Boulevard proceeds south through the Main Base then exits west, providing another access link at the West Gate to Sierra Highway and SR 14 in the town of Rosamond. From the south, 120th Street East/Lancaster Boulevard provides access to the base from the Lancaster/Palmdale area. (EAFB 1992)

Major EAFB roads include Lancaster Boulevard, Rosamond Boulevard, Mercury Road, Forbes Avenue, Mojave Boulevard, Fitzgerald Avenue, Wolfe Avenue, and Muroc Drive. Most on-base roads are two-lane roads made of asphalt with no curb or stormwater drainage system. Resurfacing has not occurred for most on-base roads for many decades, and the life expectancies of some roads have been exceeded. Engineering design has been performed to maintain/upgrade roads on EAFB, as necessary, and some upgrades have been completed. Repairs and upgrades will continue; however, this work does not need to be accelerated on behalf of the X-33 Program. (EAFB 1992)

On- and off-base roads typically operate at less than capacity (except for some intersections and base access gates) during peak hours. South and West access gates, as well as the intersection of Rosamond and South Muroc, experience delays during peak hour conditions. (EAFB 1992)

Transportation analysis for AF Plant 42 and vicinity includes the principal road network near the northern portion of the plant, access roads at 30th Street East and Avenue M (which runs east-west along the northern boundary of the plant), and two transportation alternative modes for moving the X-33 to EAFB. The proposed road transportation route for the X-33 is the same as the overland transportation route modified for NASA Space Shuttle Orbiters (JSC 1976). The route begins at Site 1 and continues through 10th Street East (a public road) to EAFB. Overhead power lines, telephone lines, and light poles were modified to provide clearance for the Space Shuttle. (EAFB 1992)

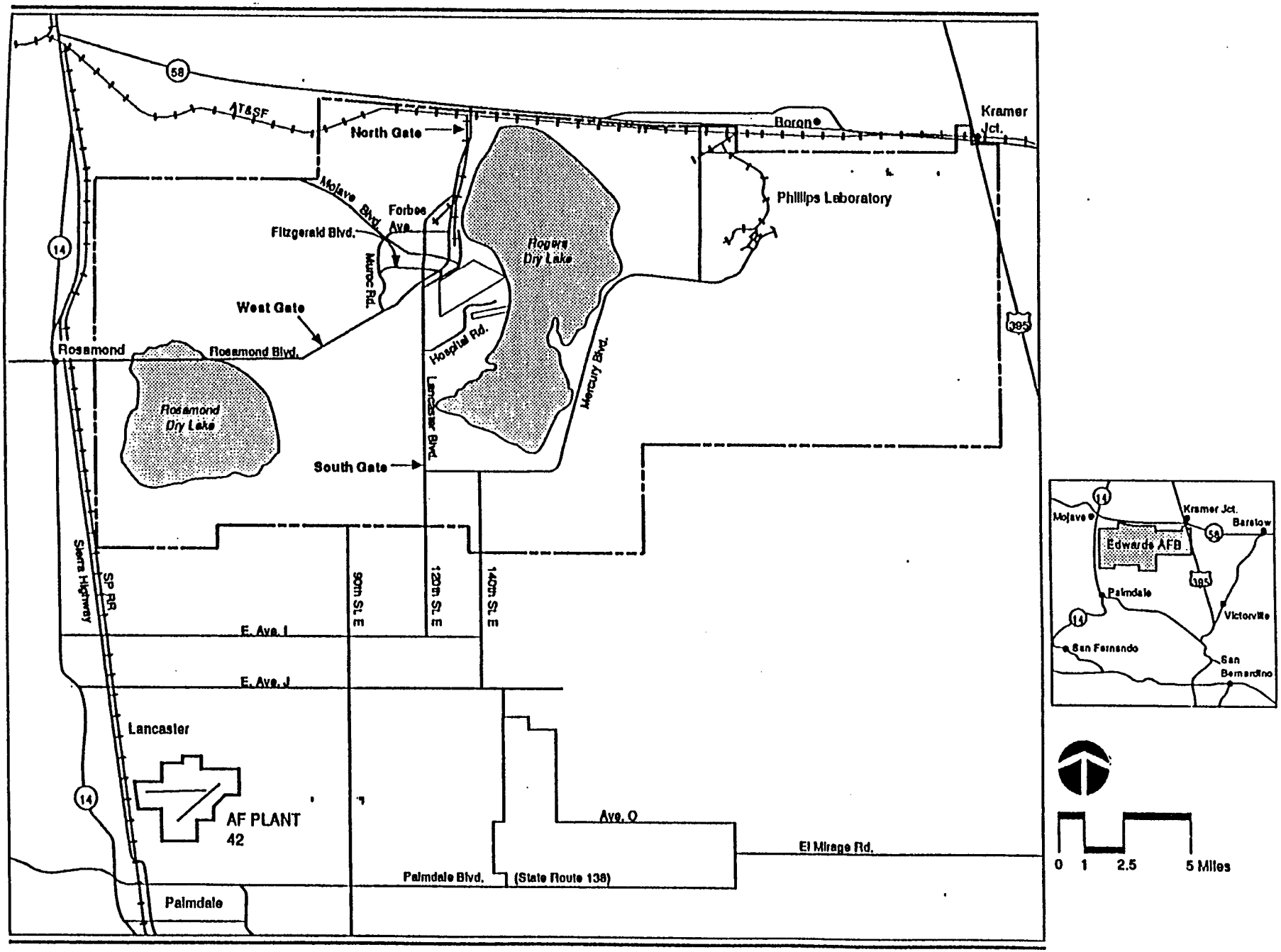

Figure 3.1-3. EAFB Transportation Map

Railroads

Railroad access to EAFB is from the Atchison Topeka and Santa Fe (AT&SF) railroad, which runs east-west north of the base boundary. Two railroad spurs from the AT&SF main line service separate portions of the base. The western spur follows Rosamond Boulevard into the Main Base and has two termination points: one at the Main Base and the other at several storage tanks west of the Main Base. A second spur connects the main line with the PL area, east of Rogers Dry Lake. In general, the rail spurs are in acceptable condition for use as light duty spurs. The western spur is currently used at least four times per year. (EAFB 1992-C). A Southern Pacific Railroad line runs parallel to the western boundary of EAFB, but does not serve the base. (EAFB 1994-B)

Airports

AF Plant 42 serves as the Palmdale Regional Airport under a Joint Use Agreement with the Los Angeles Department of Airports. Palmdale Regional Airport, comprising 22 ha (54 ac) of AF Plant 42, offers commercial air travel capabilities to Antelope Valley in addition to providing an alternative to Ontario and Los Angeles Airports. Flight activities are conducted on the same airfields used by Government contractors. (EAFB 1992)

Existing runways at AF Plant 42 and EAFB would be used for carrier aircraft return of the X-33 spaceplane. (EAFB 1992)

3.1.1.12 Population and Employment

The region of influence for EAFB is defined as the communities of Lancaster, Palmdale, Rosamond, Edwards/North Edwards, California City, Tehachapi, Mojave, and Boron. The population of this region is approximately 260,000 persons. The population of EAFB, which includes the daytime, on-base worker population and dependents living on the base, is approximately 21,000.

The local economy has experienced rapid employment growth during the past decade, with the greatest increases in the services, aerospace, and trade industries. The largest employer in the western Mojave Desert is EAFB. In 1990, professional and technical positions made up 44.6 percent of the total labor force in the region compared to only 15.7 percent for the nation. This percentage results from the fact that the aerospace industry is a primary business in the region. Most of the technology/aerospace firms in the area are located in the Palmdale and Lancaster areas. (EAFB 1992, EAFB 1994-A)

3.1.2 WSMR/WSTF

This section discusses the affected environment related to the proposed takeoff and landing sites on WSMR described in Section 2.3.3.2.

3.1.2.1 Facilities and Infrastructure

Wastewater Treatment

The domestic WWTP servicing the Main Post is located approximately 2.4 km (1.5 mi) southeast of the area. Influent wastewater flows range from 1.8 to 2.4 mLd (485,000 to 650,000 gpd). The WWTP currently operates at 50 percent capacity. The domestic wastewater collection system operates between 20 and 25 percent capacity during peak flow periods. (WSMR 1996-A)

The Stallion Range Center (SRC) area is served by a central domestic wastewater collection system that conveys sewage to a septic tank facility. Wastewater is then discharged into four oxidation ponds with a total volume of approximately 4.9 million L (1.3 million gal). Due to relatively low influent flows, the level of ponds is negligible, and full capacity has not been used. Existing capacity has been calculated to be approximately 34,000 Lpd (9,000 gpd). (WSMR 1996-A)

Wastewater on WSSH is captured, containerized and hauled to a treatment plant. WSTF domestic wastewater is treated through biological degradation and evaporation utilizing six lagoons. (WSMR 1996-A)

Electricity

Electricity at WSMR is primarily furnished via commercial power from El Paso Electric Company, with additional power provided by Otero County Electric Cooperative, Sierra Electric Cooperative, and Socorro Electric Cooperative. Socorro Electric Cooperative is the predominant service in the north range, whereas El Paso Electric Company serves the main WSMR and lower range areas. Each company has a distribution substation on WSMR. El Paso Electric Company owns, operates, and maintains distribution voltage facilities throughout WSMR and serves the majority of the south range area with 345- and 115-kV transmission lines and 14- and 24.9-kV distribution lines. WSMR Load Area #1 consists of six delivery points. The current load is 102,650,000 kWh. (WSMR 1994)

Approximately 300 diesel generators are available for use. They are all considered portable, although some are permanently stationed. Generators range in output capability from 10 to 700 kVA. (U.S. Army 1994-A). Both proposed takeoff sites have ready access to electrical power. (WSMR 1996-B)

Communications

The on-range telephone system consists of a loop from the Main Post to Stallion Gate, King I to Oscura Range, and Junction 9 to Rhodes Canyon. The loop is being upgraded from underground copper cables to fiberoptic carriers. (WSMR 1994)

Off-range telephone system infrastructure is entirely provided and maintained by U.S. West. U.S. West has a major fiberoptic inground system running from Las Cruces to Alamogordo along U.S. Highway 70. (WSMR 1994)

Air-to-ground communications consist of the following:

- Radio guidance and control for command and destruct, which is limited to 406- to 550-MHz frequency bands. Use of remote control units must be scheduled 30 days in advance.

- Air-to-ground (aircraft communications) using discrete frequencies within both VHF and UHF bands, specifically the 225- to 399.9-MHz range. (WSMR 1994)

Natural Gas

The majority of buildings in the Main Post area use natural gas, forced-air, heating systems. The Gas Company of New Mexico provides WSMR with natural gas through a pipeline consisting of two high pressure (6.2 MPa (900 psi)) pipes extending from El Paso, Texas, across Fort Bliss to Alamogordo, New Mexico. (WSMR 1994)

Fuel

There are 11 UST's and 19 AST's for storage of petroleum products located at the Main Post, Rhodes Canyon Range Center (RCRC) Station, SRC, High Energy Laser System Test Facility (HELSTF), and LC-38 containing unleaded gasoline and diesel fuel. Capacities of vehicle fuel storage tanks on WSMR range in size from 11,000 to 570,000 L (3,000 to 150,000 gal). Total capacity for petroleum storage at WSMR is 1.8 million L (478,000 gal). (WSMR 1994)

JP-8 fuel is the type of aviation fuel used at WSMR. Fuel is dispensed directly to aircraft from 210,000 L (55,000 gal) tanker delivery vehicles. No permanent storage tanks exist for this fuel. Permanent fuel tanks are owned by the USAF and located at Holloman AFB. (WSMR 1994)

Ready storage capability in portable tanks for LOX and LH_2 would be installed as required to support the X-33 Program. Permanent storage facilities consisting of a 250,000 L (65,000 gal) tank for LOX and a 250,000 L (65,000 gal) tank for LH_2 exist at WSTF. (WSMR 1996-B)

Hazardous Waste

WSMR has no permitted or active facilities for treatment or disposal of hazardous waste with the exception of sites for explosive destruction of munitions. Hazardous waste generated at WSMR is either disposed of or recycled at offsite facilities. WSTF has several permitted treatment facilities regulated under an approved RCRA Hazardous Waste Operating Permit which include an evaporation tank unit, waste fuel treatment unit, and open detonation unit. (WSMR 1994)

WSMR has established a Hazardous Materials Minimization Center. The Center is a single centralized storage, distribution and disposal facility for hazardous materials and hazardous waste. The facility is used by all WSMR personnel. Hazardous waste generated by the X-33 Program will pass through this facility for shipment offsite to appropriate treatment and disposal facilities.

Solid Waste

Three operating landfills serve WSMR. The Main Post landfill is located 11 km (7 mi) east of the Main Post. The second is located at SRC at the north end of WSMR, and the third is located near the High Energy Blast Facility on WSTF and is operated by NASA. WSMR has issued a Notice of Intent (NOI) to the state of New Mexico to continue operations while obtaining an operating permit. Solid waste is collected from Post Headquarters, offices, residences, and other buildings and transported to the Main Post landfill by WSMR's Ground and Surface Area Branch staff. Construction/demolition and yard wastes are transported to the site by private sector contractors and, to a lesser extent, by Ground and Surface Area Branch staff. The SRC landfill is operated by the Stallion Uprange Branch for disposal of solid and yard wastes generated in and around SRC. (WSMR 1994)

3.1.2.2 Air Quality

WSMR is located in New Mexico Air Quality Control Region (AQCR) 6. This region is in compliance with all National Ambient Air Quality Standards (NAAQS) for carbon monoxide, ozone, nitrogen dioxide, sulfur dioxide, PM_{10}, and lead. The 24-hour NAAQS for total suspended particulate matter has occasionally been exceeded. Exceedances are primarily attributable to dust storms characteristic of the windy spring months.

In addition to the Federal Standards, the state of New Mexico has set forth in Air Quality Control Regulation 201, ambient air quality standards that are as strict or more strict than NAAQS. In addition to protecting human health, the New Mexico standards are designed to protect against air pollution that injures animals and vegetation, corrodes building materials and works of art, reduces visibility, and generally diminishes the quality of life.

3.1.2.3 Airspace

WSMR controls 13 designated restricted airspace areas covering all of the range and some of the surrounding area. The restricted airspace is approximately 160 km long by 64 km wide (100 mi by 40 mi) (Figure 3.1-4). In most cases, controlled airspace can be scheduled for use from the surface to unlimited altitude 24 hours a day. Under a shared use agreement, some of the controlled airspace is turned over to the FAA for use by civilian aircraft during part of each day. (WSMR 1994)

The major restricted airspace activities are associated with research, development, testing and experimentation of military weapons systems, space vehicle components and tracking systems. Other missions include: operation of aerial drone targets; towed aerial targets; safety chase; aerial